Indian Explosives Act (IV of 1884).

FIFTH ANNUAL REPORT

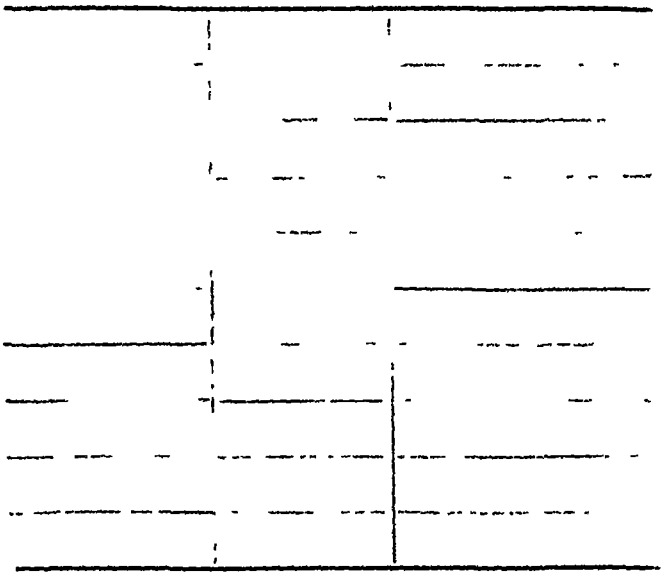
OF THE

CHIEF INSPECTOR OF EXPLOSIVES IN INDIA,

BEING HIS

Annual Report for the Year ending 31st March 1904.

CALCUTTA:
OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA
1904



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Fifth Annual Report of the Chief Inspector of Explosives in India.

No. 230.

FROM

MAJOR C. A. MUSPRATT-WILLIAMS, R.A.,

Chief Inspector of Explosives,

TO

THE SECRETARY TO THE GOVERNMENT OF INDIA,

HOME DEPARTMENT.

Calcutta, the 31st March 1904.

SIR,

Introductory.

I HAVE the honour to submit herewith a report of the work of my Department, for the year ending 31st March 1904.

Number of explosives magazines.

2. During the year 1903, 101 licenses were granted in British India under Rule 17 of the Rules to regulate the manufacture, possession, and sale of explosives. The number of magazines licensed was 146, and is in excess of the number of explosive licenses granted, because in a number of cases a firm has two or more magazines licensed on the same premises under one license. A statement, showing the number and location of the magazines, and also the number of licenses granted in each Presidency or Province, is given in Appendix A. From this statement it will be seen how widely these magazines are dispersed over the greater portion of British India, and consequently how much time has to be spent in getting from place to place, which necessarily, to a certain extent, curtails the number of inspections that can be made during the year.

Inspection work during the year.

3. During the year 284 inspections of magazines were made; all the magazines, except a few that were given up by the licensees during the year, were visited once, and a considerable number two or three times. Those magazines are inspected most frequently, which are situated in the neighbourhood of towns, or in populous localities, or which contain large quantities of explosives, or any explosive, which on account of greater susceptibility to decomposition, it is considered advisable to examine and test more often than other explosives. The Roburite Factory at Karachi was visited twice. In addition to these inspections, some oil installations and tank depôts and a number of registered premises were visited.

Condition of magazines.

4. The magazines generally are in good order, and I have found magazine owners as a rule most willing to carry out my recommendations, even when involving considerable expense, and my thanks are due to them for making my duties easy in this respect.

Condition of explosives in magazines.

5. Owing to the unprecedentedly high floods in Madras, during the North-East Monsoon, water got into some of the dynamite magazines at this place, rising a little above the level of the top of the trestles, on which the boxes of dynamite were stacked, and consquently the lowest tier of the boxes got wet. On examining some of the wet boxes and their contents at my inspection, I found that in some cases the water had penetrated the waterproof lining inside the boxes, wetting and discolouring the packages of dynamite, and liberating free nitro-glycerine. As dynamite in this state is dangerous, I reported the matter to the Commissioner of Police, Madras, recommending that the firms, owning the magazines, should be instructed to open one by one all boxes of dynamite which water had reached, and to carefully examine their contents and to put on one side for destruction by burning in small quantities, for which I gave full instructions, all packets that have been affected by water, which would be shown by discolouration of the wrappers. About 1,800 lbs. of dynamite have been destroyed.

The Inspector of Explosives has just lately reported that the physical condition of 141 lbs. gelignite in a magazine belonging to the Godavari Coal Co., at the Perakonda Graphite Mines, is not good, as it is soft and showing signs of exudation. I have recommended its destruction.

With the exceptions mentioned above, the physical condition of all the explosives in the different magazines has been found to be good. None of the samples of explosives taken at inspections failed to pass the heat tests, which were carried out by the Chemical Examiners at Calcutta, Bombay, Madras and Rangoon, and the Testing Officer at Karachi.

Thefts.

6. No thefts of explosives from magazines were reported to me during the year.

Accidents.

7. No accidents have occurred in the magazines or in the one factory (Roburite Factory) licensed in this country. A list of other accidents by fire or explosion that have occurred with explosives, inflammable substances, dangerous chemicals, etc., between the 1st January 1903 and the 31st December 1903, and that have been brought to the notice of this Department, is given in Appendix B, and gives a short account of each one. It will be seen from a persual of those details that the accidents have mostly taken place owing to gross carelessness, or through utter neglect of ordinary precautions. In all, there were 43 accidents, causing 41 deaths and injuries to 62 persons. The death-rate has practically been the same for the last four years, and cannot be regarded as a very high one, although it might very well have been less. Comparative statements given in Appendices C and D show the total number of accidents, and of persons killed and injured, during the four years, 1900 to 1904.

Gunpowder.

8. There were five gunpowder accidents during the year, causing the death of nine persons, and injuries to one. The suicidal practice of pounding and mixing the ingredients of gunpowder in a stone mortar with an iron bar or similar instrument supplies its yearly quota of victims.

Dynamite.

9. Dynamite (seven accidents) was responsible for five deaths and injuries to eighteen persons, which is in excess of previous years, *vide* Appendix C. This is due chiefly to four accidents during blasting operations at the Nishpa-tunnel on the Quetta-Nushki Railway, which is at present under construction. By these accidents fourteen coolies were injured and four others lost their lives, and the accidents can only be termed preventable ones. I cannot too strongly impress on those engaged on blasting operations, the following precautions, which, if observed, will certainly lessen the number of accidents :—

1. Never approach a fuze which has apparently missed fire for at least half an hour ;

2. Never use an iron or steel tool for ramming charges ;

3. Even with wood implements, squeeze the cartridges home gently in the bore hole, and never ram them with any force that might be liable to establish dangerous friction ;

4. After any blast, search should be made to see that no unexploded explosive remains in any of the bore holes, or in the débris produced by the explosive ;

5. Never drill in or too near old blast holes.

Fireworks.

10. Twenty accidents from fireworks have been reported to this Department, causing eight deaths and injuries to twenty-six persons. Most of the accidents are caused by the Sulphur Chlorate combination of fireworks, which are prohibited in England, but which the Government of India, after due consideration of all the points at issue, decided not to prohibit in India.

Petroleum.

11. There were nine accidents from petroleum reported during the year, which were responsible for thirteen deaths and injuries to fourteen persons. As usual, most of these were caused by ordinary lights being brought into close proximity to petroleum. It is certainly unadvisable, if it can possibly be avoided, to carry on work with petroleum between sunset and sunrise, and it is always likely to cause accidents, but if the work must be carried out after dark, some one should certainly be responsible that only safety lamps or electric hand lamps are used. As in previous years, several accidents have been caused by persons taking a light and looking into Railway oil tank wagons to see how much oil was left in them or whether they were empty, instead of using a stick as a gauge, and naturally they have paid the penalty of their temerity. The Railway authorities have now, I believe, taken the matter up and have drawn up some rules, which have been referred to me, and which I am of opinion will render these accidents less likely in future, as Station Masters will be made more responsible for them. I would point out that though petroleum and its vapour are both inexplosive in themselves and only inflammable, yet the vapour when mixed with air in certain proportions is violently explosive, if ignited. Luckily the proportions necessary to form an explosive mixture are very limited, and are more likely to occur in an empty or half empty tank than in a full one. The mixture begins to be inflammable when there is about 1·8 per cent. of vapour. Two to four per cent. of vapour makes the mixture explosive, but when the amount of vapour exceeds this maximum, the liability to explosion begins to disappear, but the mixture continues to be highly inflammable.

A great fire from petroleum broke out at 6 P.M. on the 31st March 1903 at Budge Budge, on the bank of the river Hooghly, about 14 miles from Calcutta, where all the case oil godowns and bulk oil installations of the different firms, trading in oil, are grouped in one big depôt. The case oil godowns are situated on the bank, while the bulk oil tanks are placed a little further inland. The fire originated from some cause unknown at one of the godowns at the extreme north of the whole depôt, in which were stored some four lakhs of cases, about (3,200,000 gallons) and 40,000 tins (about 160,000 gallons). The fire raged furiously but without any explosion for some days, and was not actually extinguished for about a fortnight. Luckily, while it was at its worst, the wind kept in a southerly direction, otherwise it is probable that the rest of the depôt would have become involved, instead of the fire being confined as it was to the one shed. There was practically very little oil liberated, presumably owing to its being vapourised by the great heat, and no oil got outside the retaining walls or bunds. Nothing, of course, could be done towards putting out the fire, so all attention was turned to preventing the next godown and the nearest bulk oil tank from catching fire by playing water on them and endeavoring to keep them cool, and by removing the cases of oil from the godown. I personally am of opinion that oil in bulk oil tanks is less likely to catch fire than oil stored in godowns in cases and tins, a fact which I believe is recognised by insurance companies in charging premiums, and hence, I think, it is unadvisable to have the two kinds of storage of such large quantities of oil in such close juxta-position

as at Budge Budge. Owing to the increase in the oil trade, the Budge Budge depôt has outgrown itself, and the oil tanks, case oil sheds, and other buildings are much too close together for safety, and there is considerable danger to the whole depôt in the case of fire breaking out at any particular point. It is certainly most desirable that the oil tanks should be taken from their present position, where they are too close to the workshops, in which the tins are made and filled with oil, and removed further inland, each tank being placed in its own enclosure of retaining walls or bunds and separated at least 100 feet from any other tank. This would mean that the two principal danger areas, namely, the bulk oil storage and the case oil storage, would be at some considerable distance apart with the tinning factories between them. I believe a scheme of this kind is about to be proposed by the Port Commissioners of Calcutta, and I cannot too strongly recommend that it should be adopted and carried out as expeditiously as possible. There may probably be some opposition to the scheme, but such opposition should be overcome forthwith, as, in a case of such importance and urgency, private interests should be made to give way at once to the interests and preservation of general public safety. In connection with this subject I think it is as well to repeat what I said in my Annual Report of last year, namely, that the great point with all petroleum installations, as with explosives factories, is to sub-divide the complete installation or whole danger area into a series of smaller danger areas, so enclosed, shut off, or screened from one another that any accident or disaster in one of them will not involve the others or the main installations.

Chemicals.

12. Two accidents from chemicals were reported during the year. One caused no loss of life, but the other was responsible for the death of six natives and injuries to three others. It took place in an ice factory at Benares, and was due to an ordinary light being brought near a leakage of ether, and, as the necessary proportion of ether vapour and air to form an explosive mixture happened to be present, a severe explosion took place.

Government accidents.

13. Only one Government accident was reported to this Department during the year, by which four native sappers employed in drilling blast holes on the Chitral Drosh road were injured. The details are given in Appendix E.

Imports of explosives.

14. Three millions seven hundred and seventy-eight thousand eight hundred and fifty-six pounds of explosives, or roughly about 1,889 tons, were imported by sea into British India in the year, the value being R20,19,446. Last year there was an increase of 135 tons in the imports, but this year the increase is considerably greater, *viz.*, 661 tons, *vide* Appendix G. Full details showing the different kinds of explosives imported during the year and the value of each are given in Appendix F.

15. Some points of interest in connection with the work done by this Department during the year are mentioned below:—

(*a*) The work has increased considerably during the year, and I am glad to say the Department appears to be getting well known, judging by the number of enquiries that are made to it regarding explosives and every variety of dangerous goods, both by Government officials and the mercantile community.

Importation of explosives.

(*b*) A rather important amendment was made to the rules issued by the Government of India for the transport and importation of explosives, *vide* Notification No. 2346, dated the 11th June 1903, given in Appendix H.

Temporary storage of explosives in floating magazines.

(*c*) An amendment to Rule 19-A. of the Rules for the manufacture, possession, and sale of explosives was made, allowing of the temporary storage of explosives in floating magazines. This amendment is given in Appendix J.

(*d*) This Department has suggested the desirability of having one set of consolidated rules for the whole of British India for explosives, petroleum, and Carbide of Calcium, instead of a set of rules for each Province or Presidency. I have drawn up and submitted such a set, bringing the rules up to date and introducing provisions for future eventualities. Unfortunately, I believe that, though this arrangement is permissible under the Explosives Act, it is not so under the Petroleum Act, as at present constituted. A number of amendments to the rules under the Explosives Act, including those referred to in paragraphs 17(*c*), 17(*d*), and 17(*e*) of my last Annual Report, are embodied in the consolidated rules, and they with the other rules are at present all under the consideration of the Government of India.

Consolidated rules for explosives, petroleum, and Carbide of Calcium.

(*e*) Rules for the carriage of petroleum by native passenger ships have been drawn up and finally issued by the Government of India in the Finance and Commerce Department, *vide* Notification No. 5100-S.R., dated the 20th August 1903, given in Appendix K.

Carriage of petroleum by native passenger ships.

(*f*) Under the advice of this Department an amendment has been made to the rules for the possession and transport of petroleum to the effect that "every tank or other receptacle for the storage of petroleum in bulk shall be protected by an efficient lightning conductor, provided that a tank or receptacle which is not of sufficient capacity to contain 10,000 gallons of petroleum need not be so protected, if it is so situated as not to be liable to cause danger in the event of the petroleum being ignited, *i.e.*, if it is not in close proximity to any other such tank, or receptacle, or to any buildings, and if it is surrounded by a wall or moat, or combination of both, sufficient to prevent the flow of petroleum beyond certain circumscribed limits in the event of the escape of the whole of the contents of the tank when full.

The lightning conductor has to be tested not less than once a year.

Lightning conductors for oil tanks.

(*g*) Model specifications of tanks for the storage of petroleum in bulk and of screen walls for such tanks have been circulated by the Government of India to Local Governments as a guide to the conditions which it may be advisable to adopt in the licensing of future installations. These specifications are given in Appendix L.

Model specifications of petroleum tanks and screen walls.

(*h*) Notes on the construction and managemant of small petroleum installations or tank depôts, such as may be seen near almost every railway station, were drawn up by this Department to assist District Officers in knowing what points to observe in granting licenses for small depôts. These notes were circulated to Local Governments and are given in Appendix M.

Construction and management of small petroleum installations or oil tanks.

(*i*) The question of the proposed extension of the Bombay docks has come to the notice of this Department in connection with the fact that such extension will bring the docks in close proximity to the oil installations. The installations at present in existence are those belonging to the Standard Oil Co., the Royal Dutch Co., and the Shell Transport Co. The Standard Oil Co. have only lately erected their tanks, but have not stored any oil in them. The other two Companies, who, I understand, are combining as the Asiatic Petroleum Co., have had their premises for some time, but their present leases are now drawing to an end. I believe that the question as to the risks to the proposed docks from the oil tanks, and as to whether such risks cannot be practically eliminated by means of retaining walls, fire

Extension of the Bombay docks and proximity to oil installations.

screens, and the provision of special underground tanks for running off the oil in case of fire, has been referred to Dr. Boverton Redwood and His Majesty's Chief Inspector of Explosives, England. The unexpected, however, sometimes takes place in spite of the utmost human precautions, and I am personally of opinion that, taking into consideration the value of the docks as compared with the compensation that would have to be paid if the oil tanks were removed from their present positions, it would be wiser in any case to make certain of absolute safety for the docks by the removal of the oil tanks rather than to run the chance of any risk, however small, by leaving them where they are. I am aware that in England in several places the docks and oil installations are close together, but in England there is much more difficulty than in India in getting available and unobjectionable sites for oil installations. Only lately the Burma Oil Co. have been able to get a site in a different part of Bombay for the oil installations they intend erecting.

(*j*) Certain precautions to be taken in accepting Petrol or Motor Spirit, Naphtha, Benzoline, Gasoline, Benzine and other dangerous petroleum, when tendered for carriage by railway, were suggested by this Department, and were given effect to in Government of India, Public Works Department, Circular No. 1-Railway, dated the 24th June 1903, *vide* Appendix N.

Carriage of petrol and other dangerous petroleum by railway.

(*k*) Draft conditions and rules to be made by Local Governments in granting special licenses without fee under section 5 of the Indian Petroleum Act, 1899 (VIII of 1899), to the owners of motor cars for the possession of petrol for use in such cars and for its transport on such cars for the purpose of use therein have been drawn up and submitted to Local Governments, who are now about to issue them, modified as required, according to local conditions.

Special licenses to owners of motor cars for the possession and transport of petrol.

(*l*) A rather important amendment is being made to the rules for the possession, sale, and transport of Carbide of Calcium, laying down that where an applicant for a license proposes to engage in the manufacture of Acetylene gas, the generating apparatus to be used by the licensee must, if manufactured in India, have been examined by an officer appointed by the Local Government in this behalf, and certified by him to be suitable, or, if imported, must either have been so examined and certified, or be a type approved by the Committee on Acetylene Generators appointed by the Department of His Majesty's Inspectors of Explosives, England.

Acetylene generators.

(*m*) The Government of India rules for open lines of railway in British India have, after reference to this Department, been amended so as to admit of concentrated sulphuric acid (*i.e.*, of a specific gravity, not less than 1·84) being packed in strong hermetically sealed iron or steel drums, which must be in good condition and free from rust, provided that the limit of the weight of a package is five maunds.

Packing of concentrated sulphuric acid.

I have the honour to be,

SIR,

Your most obedient Servant,

C. A. MUSPRATT-WILLIAMS, MAJOR, R.A.,

Chief Inspector of Explosives in India.

APPENDIX A.

List of Magazines and Licenses granted under Rule 17 for the year 1903.

Province or Presidency.	District.	Magazines. Under renewed license.	Under new license.	Total.	Licenses. Renewed.	New.	Total.
Assam	Cachar	2	...	2	2	...	2
	Lakhimpur	1	...	1	1	...	1
	Total	3	...	3	3	...	3
Bengal	Bankura	2	...	2	1	...	1
	Burdwan	20	...	20	17	...	17
	Darjeeling	2	1	3	2	1	3
	Gaya	1	5	6	1	3	4
	Hazaribagh	11	1	12	9	1	10
	Hooghly	4	...	4	1	...	1
	Manbhum	15	5	20	12	4	16
	Total	55	12	67	43	9	52
Bombay	Bombay	9	3	12	4	3	7
	Karachi *	8	...	8	4	...	4
	Total	17	3	20	8	3	11
Burma	Katha	1	...	1	1	...	1
	Mergui	1	...	1	1	...	1
	Ruby Mines	1	...	1	1	...	1
	Syriam	2	...	2	1	...	1
	Total	5	...	5	4	...	4
Central Provinces	Bilaspur	1	...	1	1	...	1
	Chindwara	...	1	1	...	1	1
	Jubbulpur	2	...	2	1	...	1
	Raipur	4	...	4	4	...	4
	Saugor	1	...	1	1	...	1
	Total	8	1	9	7	1	8
Madras	Godaveri	5	...	5	2	...	2
	Madras	17	...	17	5	...	5
	Nellore	4	...	4	2	...	2
	The Nilgiris	5	...	5	3	...	3
	Vizagapatam	4	...	4	2	...	2
	Total	35	...	35	14	...	14
United Provinces	Cawnpur	1	1	2	1	1	2
	Dehra Dun	1	...	1	1	...	1
	Gharwhal	1	...	1	1	...	1
	Lucknow	1	...	1	1	...	1
	Meerut	1	...	1	3	...	3
	Shahjehanpur	1	...	1	1	...	1
	Total	6	1	7	8	1	9

SUMMARY.

Assam	3	...	3	3	...	3
Bengal	55	12	67	43	9	52
Bombay	17	3	20	8	3	11
Burma	5	...	5	4	...	4
Central Provinces	8	1	9	7	1	8
Madras	35	...	35	14	...	14
United Provinces	6	1	7	8	1	9
Grand Total	129	17	146	87	14	101

* At Karachi there is in addition a Roburite Factory licensed under Rule 12.

APPENDIX B.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1903 to 31st December 1903.

No.	Date of accident.	Nature of explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	Number of persons	
					Killed.	Injured.
				Explosives.		
1	6th Mar. 1903	Gunpowder .	Bhavni, Coimbatore.	This accident took place at a festival at which small quantities of gunpowder are fired at intervals. The country gunpowder is rammed into iron tubes, about 6 inches long and 2 inches in diameter, attached to a log of wood placed in the ground. Some of the gunpowder, about 16lbs. in all, exploded unexpectedly, and two men died of burns received from this explosion.	2	...
2	5th June 1903	Country gunpowder.	Salem . .	Two coolies were engaged by a merchant to blast rocks in sinking a draw well in the backyard of his house. The coolies filled the blast holes with country gunpowder, and endeavoured to ignite the gunpowder by throwing burning coals at the holes from outside the well. As the gunpowder did not ignite, the coolies, after waiting a little time, got into the well and began to drill new holes near the old ones, when an explosion took place, and they were so seriously injured that they died from the effects.	2	...
3	31st July 1903 .	Country gunpowder.	Chinna, Agaram, Cuddalore.	Two men were mixing the ingredients for the manfacture of gunpowder in a stone mortar and were pounding the mixture with an iron bar with the natural result that it exploded, causing them such injuries that they died from the effects.	2	...
4	4th Aug. 1903 .	Country blasting powder.	Bombay . .	A blasting charge had been laid, and the fuzes ignited. As the charge did not explode, after waiting a little time, the native employed in the blasting operations went towards the charge to see what had happened. As he got near, the charge exploded and injured him so severely that he died a few hours later.	1	...
5	26th Oct. 1903 .	Country gunpowder.	Coimbatore District.	Three natives were manufacturing, without a license, and were pounding together the ingredients in a wood mortar, when an explosion took place, which caused severe injuries to all three.	2	1
				TOTAL .	9	1
6	23rd Jan. 1903 .	Dynamite .	Nishpa on Quetta-Nushki Railway (under construction).	An explosion occurred at the east heading of Nishpa Tunnel. A charge of dynamite, which had missed fire in the floor and got covered up by debris and remained unnoticed, exploded evidently under the blow of a pick, when the workmen were mucking out.	1	7
7	31st Jan. 1903 .	Dynamite .	Coorg . .	The report of the Executive Engineer, Mercara, on this accident is given below:—"Blasting operations with dynamite and a black covered fuze were in progress; Balappo (the man who lost his life) had already fired 7 charges and went up to fire the last; no one appears to have seen him do this as he called out a warning to them. The charge exploded and the man was found with the upper portion of his head blown off. It seems evident that Balappo held the light to the fuze after it had ignited, and continued doing so until the charge exploded. The men examined state that with the fuze in use it is difficult at times to see whether it has ignited or not owing to the black covering not showing signs of discolouration. I imagine that in these cases the fuze must be damp and only smouldering, and intend in future to use a white covered fuze."	1	...
8	16th Feb. 1903 .	Dynamite .	Madapur Bridge, Coorg.	Executive Engineer, Mercara, reports this accident as given below:—"Two charges of dynamite were fired together, one of which did not explode. After waiting a considerable time, the Sub-Overseer in charge went up and poured water into the hole until the fuze was saturated; and, giving strict orders that it was not to be tampered with, went to fetch another charge with which to fire the first one. In his absence the contractor and another man removed the tamping, the fuze, the detonator, and the dynamite, and thinking the hole was not deep enough commenced to deepen it by means of a short steel jumper and a sledge hammer, holding the jumper himself and a cooly using the hammer. A portion of the charge must have been left in the hole, as an explosion occurred and the contractor's hands were badly injured by it and the cooly's eyes damaged by grit and sand."	...	2

No.	Date of accident.	Nature of explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	Number of persons Killed.	Number of persons Injured.
				Explosives—*contd.*		
9	3rd Apl. 1903 .	Dynamite .	Nishpa Tunnel .	An explosion occurred at 3 A.M. on the 3rd April owing to an unfired blast of the previous day being struck by a cooly with his jumper when drilling fresh blast holes. Five coolies were injured more or less severely.	...	5
10	10th Sept. 1903 .	Dynamite .	Nishpa Tunnel .	This explosion occurred owing to the jumpers of the coolies preparing blast holes coming into contact with misfired cartridges from previous blasts. The explosion killed two men and severely injured another.	2	1
11	16th Nov. 1903 .	Dynamite .	Nishpa, Quetta-Nushki Railway.	Two coolies were drilling in an old blast hole, which was strictly against orders. Evidently there was a partially fired charge in it, as an explosion took place, killing one man and injuring the other.	1	1
12	30th Dec. 1903 .	Dynamite .	Coorg . .	While quarrying stone on the Mercara-Periambody Road, it appears that a misfire occurred and two coolies were sent out the next morning to jump a fresh hole. Instead of doing so, they tried to extract the dynamite which exploded.	...	2
				TOTAL .	5	18
13	8th May 1903.	Fireworks .	Maldah . .	Four women were grinding ingredients for the manufacture of bombs, when there was an explosion probably caused by friction, and this communicated itself to a heap of powder in the same room. The four women were killed.	4	...
14	6th June 1903 .	Fireworks, consisting of charcoal, saltpetre, sulphur and iron powder.	Calcutta . .	A man was holding a quantity of this mixture in a paper in his hand, and was testing it by putting small quantities into the fire, with the result that the whole lot caught fire and he was severely burnt.	...	1
15	1st Oct. 1903 .	Fireworks; chlorate of potash and red arsenic (sulphide of arsenic).	Bombay . .	Two men were mixing chlorate of potash and sulphide of arsenic and were using a heavy iron chisel as a mixer, with a result that the mixture was ignited and they were both severely burnt.	...	2
16	12th Oct. 1903 .	Fireworks; crackers consisting of chlorate of potash, red sulphide of arsenic and small pieces of stone.	Jorabagan, Calcutta	Nine native lads were manufacturing these crackers (bombs) when one of them exploded and the rest of the ingredients lying about caught fire and there was a general explosion, causing severe injuries to seven of the lads, and light injuries to the other two.	...	9
17	14th Oct. 1903 .	Fireworks; Chinese crackers and pyrotechnic matches.	Bombay . .	Extracts from report of Commissioner of Police, Bombay:— "A licensed dealer in fireworks bought a box of Chinese crackers. The box was covered with matting which he cut open with a knife and the box itself he forced open with his hands. He had taken out about half the crackers and placed them in the centre of the shop, when some pyrotechnic matches, manufactured in Europe, which he had previously bought and which were lying in front of the shop, took fire. The owner tried to throw these on to the street, but failed to do so quickly enough to prevent his whole stock from exploding and setting fire to the house. No one was in the shop at the time except the owner, who jumped into the street and raised an alarm; and no one was injured. The estimated damage done by the fire to the house is said to be about Rs. 2,000. No reason can be adduced for the explosion except that perhaps a spark from the "biddee" of some passer-by may have fallen on them, setting fire to them.	...	...
18	17th Oct. 1903 .	Firework; mixture of chlorate of potash and sulphide of arsenic.	Angaryanathur, Madras Presidency.	A native was mixing and grinding chlorate of potash and sulphide of arsenic together for the purpose of making small bombs, when an explosion took place, injuring him so severely that he died from the effects a few days afterwards.	1	...
19	18th Oct. 1903 .	Fireworks; consisting of chlorate of potash, red sulphide of arsenic and stones.	Calcutta . .	A woman was carrying a quantity of bombs and crackers from one room to another in an earthen chatty. She accidentally let the chatty fall with the result that there was an explosion, which caused her severe injuries.	...	1
20	Ditto .	Fireworks, consisting of chlorate of potash and red sulphide of arsenic.	Calcutta . .	A native lad was filling a tin pipe with fireworks, when they suddenly exploded and caused him severe injuries.	...	1
21	19th Oct. 1903 .	Crackers, consisting of chlorate of potash.	Vizianagram .	While a man was manufacturing these crackers, they suddenly exploded, and the man was so injured that he died the next day. The cause of the accident could not be ascertained.	1	...

No.	Date of accident.	Nature of explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	Number of persons	
					Killed.	Injured.
				Explosives—*concld.*		
22	20th Oct. 1903	Fireworks	Poona	Some fireworks were being let off near some huts which caught fire, and about a dozen of them were completely burned down.	...	...
23	20th Oct. 1903	Fireworks; explosive pellets consisting of sulphur, sulphate of antimony and nitrate of potash.	Poona	A native bought two annas worth of explosive pellets, and, finding that these did not make as much noise as he wanted when exploding, he, with two other natives, opened out the pellets, thirty-two in number, with a view to making one large pellet out of a couple of the small ones. Whilst doing this he let drop a pellet which exploded and set fire to the inflammable material which had been scattered about the room during the opening of the pellets. The three natives with another, who came to assist to put out the fire, all got injured by some of the pellets exploding.	...	4
24	23rd Oct. 1903	Fireworks, consisting of chlorate of potash and red arsenic (sulphide of arsenic).	Bombay	A native woman was manufacturing explosive pellets when an explosion took place, injuring her so severely that she died shortly afterwards, and slightly wounding an on-looker. The exact cause of accident was not ascertained, but as the mixture used for these pellets is very susceptible to explosion, either by friction, or a blow, or a fall, it was probably due to one of these causes.	1	1
25	October 1903	Fireworks	Koraput, Vizagapatam.	A schoolmaster while grinding potassium and sulphur for preparing fireworks was injured by an explosion of the same.	...	1
26	1st Nov. 1903	Chinese crackers, consisting of saltpetre, sulphur and charcoal.	Bombay	A native went to a firework shop to buy Chinese crackers. He picked one up, and while stooping to pick up another, the cigarette he was smoking came in contact with the first cracker, exploding it, and he was badly burnt about the head.	...	1
27	5th Nov. 1903	Fireworks	Bombay	An explosion took place in the shop of a firework dealer, setting the building on fire and doing considerable damage. It was caused by a person letting off a rocket, which fell into the shop, exploding the firework.	...	
28	15th Nov. 1903	Fireworks; bombs consisting of chlorate of potash and sulphide of arsenic.	Sonarpur, 24-Perganas.	An explosion occurred when two native lads were preparing these bombs, injuring them both. They were using an iron tool.	...	2
29	23rd Nov. 1903	Fireworks	Bombay	A fire broke out in a firework shop in Harris Road Works, and several other buildings were involved, causing a loss of about Rs. 4,000 worth of property. The cause of the fire could not be ascertained.	...	...
30	4th Dec. 1903	Firework mixture, consisting of chlorate of potash and red sulphide of arsenic.	Calcutta	A native lad was loading a brass toy cannon with a powder composed of chlorate of potash and sulphide of arsenic when the powder suddenly exploded and burst the cannon, causing him severe injuries.	...	1
31	4th Dec. 1903	Fireworks, consisting of sulphur and red arsenic, tied up in paper with a small pebble	Bombay	The Commissioner of Police, Bombay, reports that a native while letting off fireworks was severely burnt. The fireworks were lying on the ground, and one, which he had in hand, fell amongst those of the ground and exploded the lot.	...	1
32	10th Dec. 1903	Box corsisting of blue lights, fog signals, rockets, etc.	Bombay	The Commissioner of Police, Bombay, sent the following report:—The Government Surveyor condemned certain stores belonging to the British India Steam Navigation Co., consisting of blue lights, signals, rockets and distress rockets, in all about twenty in number, which were afterwards packed in a box for disposal. The Store-keeper of the Company sent these explosives out to sea in a prow for the purpose of having them thrown overboard into deep water. After proceeding some distance out, the crew decided to cast anchor. The box containing explosives was placed forward on the prow, the crew of which consisted of six men and a tindal. At the time the explosion occurred five of the crew were in the stern of the boat, and the tindal and the other man forward, where the explosives were placed. There is no reason why these men should have cast anchor before proceeding to deep water and throwing the explosives overboard. The fact of their anchoring leads one to believe that their intention was to appropriate the contents of the rockets to their own use. When the prow was taken charge of by the Police, about six rockets were found lying on the deck, which shows that the crew must have been handling the contents of the box. When leaving Bombay all the rockets were in the box. No trace of any exploded material could be found on board, and no damage was done to the prow, except, where the explosion is supposed to have taken place, a piece of the side, about eight inches square and a couple of inches deep, was blown away.	1	1
				TOTAL	8	26

No.	Date of accident.	Nature of oil.	Where accident occurred.	Circumstances of accident so far as ascertained.	Number of persons	
					Killed.	Injured.
			Petroleum.			
33	28th Feb. 1903 .	Kerosine .	Kosgi Railway Station Siding, Madras Railway.	A contractor's servant was trying to get into an empty oil tank wagon to see if there was any oil left that he might pilfer, while a boy held a light for him, with the result that there was an explosion, killing the man and severely injuring the boy.	1	1
34	16th Mar. 1903	Petroleum .	Tankshabin, Minbu District, Burma.	A fire broke out in a native refinery in the pits where the refuse petroleum, left after distillation, was stored. No particular damage seems to have been caused. It was believed that the fire originated through carelessness.	...	...
35	31st Mar. 1903	Kerosine .	Budge-Budge, Calcutta.	A fire broke out in Port Commissioners' shed No. 4 for the storage of oil in cases and tins and raged for a number of days. Luckily the shed was to the north of all the other sheds and of the bulk oil tanks and the breeze was southerly; otherwise the rest of the storage installation might have become involved. The cause of the fire could not be ascertained.	...	...
36	5th Apl. 1903 .	Kerosine .	Ramchandrapur, Coconada.	A marriage procession was proceeding along a street accompanied by men carrying kerosine oil torches. Fireworks also were being carried along and fired. A spark from the torches fell into a basket containing fireworks and gunpowder, and there was an explosion which frightened the torch-bearers who threw down their torches, and the lighted kerosine set the clothes of fifteen people on fire, burning them, so that seven of them died from their injuries.	7	8
37	11th May 1903 .	Kerosine oil .	Alamnagar Station	Oil was being emptied from a tank wagon after dusk, which is against rules, and caught fire probably through the coolies engaged in the operations bringing a light near. There was an explosion, which so seriously injured one man that he died from the effects.	1	...
38	21st May 1903 .	Kerosine .	Mirzapur Station, East Indian Railway.	An explosion occurred in an oil tank wagon containing oil belonging to Messrs. Shaw, Wallace and Co., which was being emptied. Their agent took a small naked lamp to the man-hole to see how much oil was left in and managed to drop it in the oil with the result that there was an explosion, and he and three coolies were seriously injured, and the agent and two of the coolies died next day. Work was being conducted after dusk which is against rules.	3	1
39	30th May 1903 .	Oil vapour .	Budge-Budge, in a tank boat belonging to Messrs. Shaw, Wallace & Co., of Calcutta.	Messrs. Shaw, Wallace and Co.'s Manager submitted the following report :—Shortly after my arrival at Budge-Budge last evening a fire was reported in tank boat No. 1. On going over I found an explosion had taken place (no fire), the gas having ignited from a spark, caused apparently while the flexible steel pipe was being hauled through the man-hole of the hatch. Mr. Street was supervising the filling of the boat, and explains that the friction caused by the spiral steel against the edge of the W. I. ring of the man-hole made the spark, and as there was no fire about to cause the accident, the explanation given is quite feasible. There has been no loss of oil. The boat is damaged, and the deck-plates are buckled, and the hull partly bulged above water mark. The accident, in my opinion, could not have been foreseen, and in future rubber hose will be used at the end of the main when loading boats.	...	...
40	24th Oct. 1903 .	Crude oil .	Singu, Burma .	Crude oil was being pumped on board a flat by the Burma Oil Company when flames suddenly broke out, spreading with great rapidity, and completely gutting the vessel so that her back was broken and she became a total wreck. Three natives got burnt and one died from his injuries. The actual cause of the fire could not be ascertained.	1	3
41	13th Nov. 1903.	Crude oil .	Yenangyaung, Burma.	The Sub-Divisional Officer, Yenangyaung, reports that an explosion occurred at boring No. 112 state well at 11-15 P.M., and that at 3 o'clock in the afternoon the oil sand was struck at a depth of 900 feet. As there was no tank, a hole was dug behind the derrick to keep the oil as it came out, and a durwan was kept in charge of it. Just before dark the durwan sent word to the Manager that the hole would be full at 11 P.M., and the latter replied that it should be allowed to overflow. Precisely at 11-15 P.M. the oil caught fire and exploded. The durwan was found lying in his hut not far away from the burning well, badly burnt. The cause of the explosion is not known, but it is highly probable and generally believed that the durwan sat down near the hole and struck a match to see if it was full, and the lighted match set fire to the flowing oil. The derrick and drilling implements were all destroyed.	...	1
				TOTAL .	13	14

No.	Date of accident.	Nature of chemical.	Where accident occured.	Circumstances of accident so far as ascertained.	Number of persons	
					Killed.	Injured.
				Chemicals.		
42	11th Apl. 1903 .	Phosphorous.	Bombay . .	A consignment of ordinary yellow phosphorous was being conveyed in a cart in the streets of Bombay. The phosphorous was packed under water in 10-lb. tins, two of which were enclosed in a wood case. One of the cases caught fire on the journey, and the cartman threw it off the cart on to the road, where the contents blazed away till extinguished by sand. The cause of ignition was believed to be due to the fact that the tins were leaky and consequently some of the phosphorous got uncovered by the water and combining with the oxygen of the air burst into flame, the ignition being accelerated by the friction due to transport.	...	...
43	16th Aug. 1903.	Ether . .	Benares . .	The District Magistrate of Benares reported as follows:— "The accident occurred in an ice factory at about 5 P.M. by an explosion of ether, and all the men who were working there, *viz.*, nine men, including the Manager, were severely burnt. They were promptly removed to the hospital, where, after lingering for a day or two, six of the nine died. The others recovered. "The explosion was caused by the use of naked lights while drawing up the condenser from the cooling tank. A leak was suspected in the condenser, and, after disconnecting it, it was being hauled up for examination. The workmen evidently thought there was no ether in it, but as they were drawing it up, a light was taken too close to it, causing an explosion which filled the building with an incandescent gas. Two years ago the Manager was warned that the condenser was worn and that the tubes needed renewal."	6	3
				TOTAL .	6	3

Summary of accidents during the year 1903.

Kind of explosive or dangerous and inflammable substance.	ACCIDENTS CAUSING LOSS OF LIFE AND BODILY INJURY.			Accidents not causing loss of life or bodily injury.	Total number of accidents.
	Number of accidents.	Number of persons			
		Killed.	Injured.		
EXPLOSIVES.					
Gunpowder	5	9	1	...	5
Dynamite	7	5	18	...	7
Fireworks	16	8	26	4	20
TOTAL	28	22	45	4	32
PETROLEUM.					
Petroleum generally	6	13	14	3	9
TOTAL	6	13	14	3	9
CHEMICALS.					
Phosphorous	...	...	...	1	1
Ether	1	6	3	...	1
TOTAL	1	6	3	1	2
MISCELLANEOUS.	...	...	...	...	...
TOTAL	...	...	...	...	...
GRAND TOTAL	35	41	62	8	43

APPENDIX C.

Detailed Statement showing number of accidents and persons killed and injured during the four years, 1900 to 1903.

Year.	Gunpowder.			Dynamite and other nitro-compound blasting explosives.			Fireworks.		
	No. of accidents.	Persons killed.	Persons injured.	No. of accidents.	Persons killed.	Persons injured.	No. of accidents.	Persons killed.	Persons injured.
1900	5	22	5	3	...	4	8	4	9
1901	9	8	10	7	3	14	12	12	18
1902	10	8	8	2	1	4	25	22	40
1903	5	9	1	7	5	18	20	8	26
Total	29	47	4	19	9	40	65	46	93
Average	7	12	6	5	2	10	16	11	23

Year.	Chemicals.			Petroleum.			Miscellaneous.		
	No. of accidents.	Persons killed.	Persons injured.	No. of accidents.	Persons killed.	Persons injured.	No. of accidents.	Persons killed.	Persons injured.
1900	6	1	11	3	14	...	...	...	...
1901	4	1	1	6	21	3	...	...	...
1902	5	2	2	3	7	1	2	4	
1903	2	6	3	9	13	14	...	...	...
Total	17	10	17	21	55	18	2	4	...
Average	4	2	4	5	14	4	...	1	...

APPENDIX D.

Comparative Statement showing number of accidents and persons killed and injured during the four years, 1900 to 1903.

Year.	ACCIDENTS CAUSING LOSS OF LIFE OR BODILY INJURY.			Accidents not causing loss of life or bodily injury.	Total number of accidents.
	Number of accidents.	Number of persons			
		Killed.	Injured.		
1900	23	41	29	2	25
1901	32	45	46	6	38
1902	42	44	55	5	47
1903	35	41	62	8	43
Total	132	171	192	21	153
Average	33	42	48	5	38

APPENDIX E.

Accidents by fire or explosion which have been brought to the notice of the Explosives Department from 1st January 1903 to 31st December 1903.

No.	Date of accident.	Nature of explosive.	Where accident occurred.	Circumstances of accident so far as ascertained.	Number of persons	
					Killed.	Injured.
Government Accidents.						
	26th June 1903 .	Gun-cotton .	Shishi Kut . .	At about 8 A.M., while a number of sappers were drilling blast holes on the Chitral Drosh Road, there was an explosion injuring four of them. A court of enquiry was held and decided that no blame was attachable to anyone. The sappers had been engaged in blasting work on this road up till the last week in May, when it was discontinued and operations were undertaken elsewhere. On the 25th June the sappers commenced work again on this same road, and on the 26th the accident occurred. It is believed that it was due to the residue of a charge, only partially detonated in the previous May, being exploded by the concussion caused by the jumpers used in drilling holes in its proximity. It is probable that a charge of wet gun-cotton, which was too wet to be entirely detonated by the dry primer, had by the temperature of the atmosphere become so dried by the 26th June as to be very senstive to any concussion. The old bore hole had become closed up by dust and general debris, so that it was not observed when fresh operations were commenced.	...	4

APPENDIX F.

Statement showing the import of explosives by sea into British India from other countries in the year 1903.

Quantity.	Imports in 1903.					
	Bengal.	Bombay.	Sind.	Madras.	Burma.	Total.
Gunpowder, black ... lbs.	66,420	92,049	38,129	68,575	7,250	2,72,423
Gunpowder, smokeless ... „	8,126	4,925	16,040	1,913	...	31,004
Dynamite ... ... „	2,02,496	60,000	1,14,000	...	39,984	4,16,480
Blasting Gelatine ... ... „	12,432	...	26,000	8,05,000	...	8,43,432
Gelignite or Gelatine Dynamite „	12,096	...	10,000	...	...	22,096
Other Nitro-compound Explosives „	1,75,280	46,824	...	...	...	2,22,104
Detonators ... ... No.	...	6,20,000	3,60,000	30,00,000	4,08,400	43,88,400
Fireworks ... ... lbs.	...	18,71,212	17,829	73,795	8,481½	19,71,317½
Total lbs.	4,76,850	20,75,010	2,21,998	9,49,283	55,715½	37,78,856½
Total No.	...	6,20,000	3,60,000	30,00,000	4,08,400	43,88,400
Value in Rupees.						
Gunpowder, black	55,778	43,030	9,627	24,913	8,520	1,41,868
Gunpowder, smokeless ...	23,387	18,528	22,135	4,188	...	68,238
Dynamite	1,77,464	48,526	93,521	...	32,000	3,51,511
Blasting Gelatine	14,938	...	24,982	7,56,146	...	7,96,066
Gelignite or Gelatine Dynamite	13,038	...	8,081	...	...	21,119
Other Nitro-compound Explosives	61,844	20,919	...	...	...	82,763
Detonators	16,164	9,318	7,565	57,585	5,025	95,657
Fireworks	13,683	3,91,487	9,798	41,080	6,176	4,62,224
Total Rs.	3,76,296	5,31,808	1,75,709	8,83,912	51,721	20,19,446

APPENDIX G.

Comparative statement showing the import of explosives by sea into British India from other countries during the three years, 1901, 1902, and 1903.

	1901.	1902.	1903.
Gunpowder, black ... ... lbs.	1,78,259	2,11,035	2,72,423
Gunpowder, smokeless ... „	17,379	26,605	31,004
Dynamite ... ... „	3,55,080	1,89,896	4,16,480
Blasting Gelatine ... ... „	6,10,000	7,25,000	8,43,432
Gelignite or Gelatine Dynamite „	61,950	50,000	22,096
Other Nitro-compound Explosives „	1,25,529	1,07,071	2,22,104
Detonators ... ... No.	26,79,000	32,97,509	43,88,400
Fireworks ... ... lbs.	8,33,268	11,47,223	19,71,317$\frac{1}{9}$
Total lbs.	21,81,465	24,56,830	37,78,856$\frac{1}{9}$
Total No.	26,79,000	32,97,509	43,88,400

Appendix H.

No. 2346.

GOVERNMENT OF INDIA.

HOME DEPARTMENT.

PUBLIC.

Simla, the 11th June 1903.

NOTIFICATION.

IN exercise of the power conferred by section 5 of the Indian Explosives Act, 1884 (IV of 1884), the Governor General in Council is pleased to make the following amendments in the rules to regulate the transport and importation of explosives published with the Notification of the Government of India in the Home Department, No. 5528, dated the 11th October, 1901:—

I. For paragraph 2 of Rule 8, which runs as follows:—

"Provided that any explosive other than an explosive specified in rule 11 may, previous to the grant of an importation license, if certified to be of British manufacture or, if not of British manufacture, if imported from the United Kingdom and covered by the certificate granted by one of His Majesty's Inspectors of Explosives in England, be landed in accordance with such regulations as the Local Government may prescribe in this behalf, and be stored in a place set apart by the Local Government for this purpose. The Governor General in Council may extend this privilege to any such explosive not of British manufacture regarding which he is satisfied that it has been manufactured under adequate official supervision,"

the following paragraph shall be substituted, namely:—

"Provided that any explosive other than an explosive specified in rule 11 may, previous to the grant of an importation license, if certified to be of British manufacture or, if not of British manufacture, if imported from the United Kingdom and covered by the certificate granted by one of His Majesty's Inspectors of Explosives in England, be landed in accordance with such regulations as the Local Government may prescribe in this behalf, and be stored in a place set apart by the Local Government for this purpose, or in any of such private magazines as the said Government may have notified as being suitable for this purpose. Any such explosive of British manufacture may also be transported by rail to any of such private magazines previous to the grant of an importation license. The Governor General in Council may extend to any such explosive not of British manufacture regarding which he is satisfied that it has been manufactured under adequate official supervision the privilege of landing granted by this proviso, but such explosives may not be transported by rail until an importation license has been granted."

II. In rule 10, after the words "An explosive shall not be imported by sea except at one of the Ports of Calcutta" the words "(including Moyapur and Diamond Harbour)" shall be inserted.

III. In the second clause of rule 15, for the words "All explosives of which samples are taken for examination shall be forthwith deposited in a duly licensed place or places of storage," the words "All explosives of which samples are taken for examination shall forthwith be deposited in a place or magazine set apart or notified under the proviso to rule 8," shall be substituted.

IV. At the end of condition 3 to License Form A attached to the rules the words "except in the case of explosives despatched to places or magazines set apart or notified under the proviso to rule 8," shall be added.

H. H. RISLEY,

Offg. Secretary to the Govt. of India.

Appendix J.

Draft.

I. For rule 19A the following shall be substituted, namely:—

"19A. (1) With the previous sanction of the Government of India, the Local Government may, in cases of urgency, and for any period not exceeding six months, grant a license for the possession of explosives under rule 17 in a floating magazine.

(2) Notwithstanding anything contained in rule 19, such license shall be in Form E E in the schedule hereto annexed, and shall be subject to the conditions and restrictions prescribed therein and to such further conditions and restrictions (if any) as the Local Government may in any case direct."

II. In rule 20, *after* the word and figures "rule 17" the words and figures "or rule 19A" shall be inserted.

III. In rule 32, *after* the words "granted or renewed" the words and figures "(except licenses granted under rule 19A)" shall be inserted.

IV. In the schedule, *after* Form E the following shall be inserted, namely:—

FORM E E.

(SEE RULE 19-A.)

Fee—*Twenty Rupees in Stamps.*

License to possess explosives in a Floating Magazine, granted by the Local Government.

Name of license-holder and residence.	Description of limits within which the magazine shall be moored or anchored.	Situation, character and construction of the magazine.	Description of explosive to be possessed.	Amount of explosive to be possessed at the same time in the magazine.	Date on which license expires.

DISTRICT;
190 .

Seal.

Signature of

Conditions.

1. This license is given subject to the provisions of the Indian Explosives Act, 1884 (IV of 1884), and the rules thereunder.

2. The whole vessel, barge, or craft, in or on board which explosive is stored shall be deemed to constitute the magazine.

3. The magazine shall be used only for the keeping of such explosives as may be specified in the license, and receptacles for, or tools or implements for work connected with the keeping of such explosives.

4. The interior of the magazine, and the benches, shelves, and fittings therein, shall be so constructed or so lined or covered as to prevent the exposure of any iron or steel in such manner, and the detaching of any grit, iron, steel, or similar substance in such manner, as to come into contact with the explosive in such magazine, and such interior, benches, shelves, and fittings shall, so far as is reasonably practicable, be kept free from grit and otherwise clean.

5. The magazine shall have attached thereto a sufficient lightning conductor, which shall be tested previous to the storage of explosives.

6. Charcoal, whether ground or otherwise, and oiled cotton, oiled rags and oiled waste, and any article whatever liable to spontaneous ignition, shall not be taken into the magazine.

7. Before repairs are done to or in any part of such magazine, it shall, so far as practicable, be cleaned by the removal of all explosives, and by a thorough washing out. After being so cleaned it shall not be deemed a magazine until explosives are again taken into it.

8. There shall be constantly kept in the magazine affixed in such manner as to be easily read, a copy of the license, and of any special rules that may be issued from time to time for the keeping of explosives in a floating magazine.

9. All tools and implements used in any repairs to or in any part of the magazine, shall be made only of wood or copper or brass or some soft metal or material, or shall be covered with some safe and suitable material.

10. No fires, lights, lucifer matches, or any substance or article likely to cause explosion or fire shall be permitted to be at any time in the magazine.

11. Due provision shall be made by the use of suitable working clothes, without pockets, suitable shoes, searching and otherwise, or by some of such means for preventing the introduction into the magazine of fire, lucifer matches or any substance or article likely to cause explosion or fire, and for preventing the introduction of any iron, steel, or grit into any part of the magazine, where it would be likely to come into contact with explosive, and in any part of the magazine in which any explosive is kept which is liable to be dangerously affected by water, due precautions shall be taken to exclude water from such part; but this condition shall not prevent the introduction of an artificial light of such construction, position, or character, as not to cause any danger of fire or explosion: and so much of this condition as relates to the exclusion of iron, steel, or grit shall not be obligatory in the case of a magazine in which no explosives other than explosives of the 1st Division of the 6th (Ammunition) Class is kept.

12. No person shall smoke in any part of the magazine.

13. (1) The licensee shall not employ any vessel, barge or craft to carry an explosive to or from the magazine unless the cabin, hold or other part of the vessel, barge or craft in which the explosive is or is to be carried—

(*a*) is constructed without any exposed iron or steel in the interior thereof,
(*b*) contains only explosives, and
(*c*) is closed or otherwise properly covered over:

Provided that clause (*a*) shall not apply in the case of any vessel, barge or craft which carries no explosive other than explosives of the 1st Division of the 6th (Ammunition) class, or which is specially exempted by an order of the Chief Inspector of Explosives or by an order of the Local Government endorsed on this license.

(2) The licensee shall see that the explosives to be placed on any vessel, barge or craft so employed are loaded, carried and unloaded with all due diligence and with such precautions and in such manner as will sufficiently guard against any accidental ignition.

14. The licensee shall see—

(*a*) that no fire, unprotected light or smoking is allowed while any explosive [other than explosives of the 1st Division of the 6th (Ammunition) class] is being received or delivered, or while the hatches or door of the magazine, or the hatches or coverings of any vessel, barge or craft alongside containing any such explosive, are open, and

(*b*) that no receipt or delivery of explosives is carried on, and the hatches or door of the magazine are or is kept closed, when any vessel, barge or craft having on board a fire (other than engine-fires properly banked up) or an unprotected light is alongside a magazine containing an explosive of the 1st Division of the 6th (Ammunition) class, or in its immediate vicinity.

15. A person under the age of sixteen years shall not be employed in or enter the magazine, except in the presence and under the supervision of some grown up person.

16. In the case of the magazine being approachable at low water by carriages, the words "vessel, barge, or craft" shall in Nos. 12 and 13 of these conditions be taken to include carriage.

17. Two or more descriptions of explosives which may lawfully be possessed in a licensed magazine, may be possessed in the same magazine, if they are separated from each other by an intervening partition of such substance and character, or by such intervening space, as will effectually prevent explosion or fire in one compartment from extending to another compartment, subject to the following qualifications:—

(*a*) the various explosives of Classes 1 (Gunpowder), 2 (Nitrate-mixture), 3 (Nitro-compound), and 4 (Chlorate-mixture), safety fuze belonging to the 1st Division of Class 6 (Ammunition), and such of the various explosives of the 2nd Division of Class 6 (Ammunition), as do not contain any exposed iron or steel, may be kept with each other without any intervening partition or space,

(*b*) the various explosives of the 1st Division of Class 6 (Ammunition), may be kept with each other without any intervening partition or space,

(*c*) such of the various explosives of the 2nd Division of Class 6 (Ammunition) as contain any exposed iron or steel, may be kept with each other without any intervening partition or space,

(*d*) the various explosives of the 3rd Division of Class 6 (Ammunition), may be kept with each other without any intervening partition or space,

(*e*) the various explosives of class 7 (Firework), may be kept with each other without any intervening partition or space.

Save as aforesaid, two or more descriptions of explosive shall not be kept in the same magazine.

APPENDIX K.

No. 5100-S.R.

GOVERNMENT OF INDIA.

FINANCE AND COMMERCE DEPARTMENT.

STATISTICS AND COMMERCE.
Commerce and Trade.
Native Passenger Ships.

NOTIFICATION.

Simla, the 20th August 1903.

IN exercise of the powers conferred by section 53 of the Native Passenger Ships Act, 1887 (X of 1887), the Governor General in Council is pleased to make the following rules regarding the carriage of petroleum in ships to which the said Act applies:—

1. No petroleum which is dangerous within the meaning of the Indian Petroleum Act, 1899 (VIII of 1899), shall be shipped on board any ship proceeding or departing from British India, and no other petroleum shall be carried on board such a ship otherwise than in accordance with the following conditions, namely,—

(*a*) The master, owner or agent shall give notice to the Chief Customs-officer or such other officer as the Chief Customs-officer may nominate in this behalf, before permitting any petroleum to be shipped.

(*b*) Each consignment of petroleum shipped shall be covered by a declaration made and signed by the shipper in Form A (hereto annexed), if the petroleum has been imported into British India, and otherwise in Form B.

(*c*) Petroleum shall be shipped either in tins enclosed in outer wooden cases or in hermetically sealed iron or steel drums.

(*d*) The nature of every consignment of petroleum shipped shall be marked on the outside of the package containing it.

(*e*) Petroleum shall be stored separate from all other cargo and as far as possible away from lights or fires, and none shall be stored in any hold adjoining an engine or boiler.

(*f*) There shall be a water tight bulkhead between the engine room and any hold in which petroleum is stored, and the sluice-valves of such bulkhead shall be shut down and padlocked.

(*g*) Save where electric light is used, no petroleum shall be shipped or discharged except between sunrise and sunset; no lights other than electric lights shall be lit in a hold in which petroleum is stored; and no smoking shall be permitted in or near any such hold.

(*h*) No person shall otherwise than along with, or with the authority of, an officer of the ship, be permitted to visit a hold in which petroleum is stored.

(*i*) No more passengers shall be carried than can with safety be accommodated in the ship's boats in case of accident, unless the vessel is a coasting one proceeding on a short voyage and there are provided life-belts sufficient for such passengers as cannot be accommodated in the boats.

(*j*) At any port in which a ship carrying petroleum is for the time being the Chief Customs-officer, or such other officer as the Chief Customs-officer, may nominate in this behalf, may take and test any consignment of such petroleum or any single case or drum thereof.

(*k*) If any petroleum tested under clause (*j*) is found to be dangerous petroleum defined as aforesaid, the whole consignment of which the petroleum tested formed a part shall be liable to confiscation.

2. The officer authorised to grant a certificate in respect of a ship under sections 7 and 12 of the Native Passenger Ships Act, 1887 (X of 1887), shall, if there is petroleum on board, not grant the same without the consent of the Chief Customs-officer or such other officer as the Chief Customs-officer may nominate in this behalf.

3. Whoever commits a breach of any of these rules shall be punishable with fine which may extend to two hundred rupees, and, when the breach is a continuing one, with a further fine which may extend to twenty rupees for every day after the first during which the breach continues.

FORM A.

We hereby do declare that the cases and drums marked as follows :—

presented for shipment on the S. S. contain imported petroleum and that the petroleum is contained in the original packages, in which it was imported into this country.

Shippers.

Place
Date

FORM B.

We hereby declare that the whole of the petroleum contained in the cases of drums marked and presented for shipment on S. S. is petroleum which is covered by flash point certificate No. , dated , from the officer appointed by the Local Government for testing petroleum, a true copy of which, certified to by us, is herewith attached.

Shippers.

Place
Date

(Sd.) E. N. BAKER,
Offg. Secretary to the Government of India.

APPENDIX L.

MODEL SPECIFICATIONS OF TANKS FOR THE STORAGE OF PETROLEUM IN BULK AND SCREEN WALLS FOR SUCH TANKS.

GENERAL.

Any tank which satisfies the following conditions shall be deemed to be suitable for the storage of petroleum in bulk :—

(1) It must be constructed of good metal.

(2) It must be properly tested before use, and seen to be perfectly tight and staunch.

(3) It must at all times while in use be so well fitted that the inflammable liquid contained in it cannot escape thereform in the form of liquid, whether under the action of fire or otherwise.

(4) If it has a ventilating pipe, that pipe must be of suitable character and construction, and its orifice must be effectively protected by wire gauze.

(5) Every other opening in the tank, whether to be used as a manhole or for a pipe or other purpose, not being such a ventilating pipe as aforesaid, must have a neck whose length is at least equal to one-half of the diameter of the opening, and every such opening, when not in actual use, must be securely closed by an effective and properly secured cap, cover or tap.

(6) It must be further constructed as hereunder specified according as it is an underground or overground tank—that is to say :

I.—Underground Tanks.

A tank shall be deemed to be an underground tank which is wholly sunk in and surrounded by solid rock or earth, and the top of which is protected by a substantial covering of not less than nine inches of solid earth, sand or concrete. There must be no opening in such top or covering, other than such manholes, pipes, pumps, or other connections as may be necessary.

Every underground tank must be constructed of strong iron or steel tank-plates well riveted together and thoroughly caulked. The tops and sides must be supported and strengthened by such uprights, girders, angle-irons and ties as, having regard to the capacity and situation of the tank, may be necessary to render the tank thoroughly substantial and effective.

The underground space in which the tank is enclosed must be of such construction and character that mineral oil cannot escape thereform in the form of liquid, whether under the action of fire or otherwise, so as to reach either directly or indirectly any other place where inflammable liquid is kept, or any protected work,* or any river, sewer, stream or drain.

II.—Overground Tanks.

Every tank shall be deemed to be an overground tank which in respect of situation does not satisfy the conditions hereinbefore specified for an underground tank.

If the tank is to be placed or fixed elsewhere in a building than on the basement, its position must be approved by the local authority.

(*a*) Every tank of a capacity not exceeding 60 gallons must be well constructed of galvanized iron of such strength, having regard to its size, and with seams so securely closed and fastened, as to form an effective receptacle for the inflammable liquid which it contains.

* Protected works are buildings in which persons dwell or assemble, docks, wharves, timberyards, other petroleum stores and any other place which the local authority may declare as such.

(*b*) Every tank of a capacity exceeding 60 but not exceeding 1,000 gallons must be constructed of good galvanized iron plates of such thickness, and with rivets of such size and at such distances apart (measured from centre to centre) as appear in the following scale:—

For tanks of a capacity not exceeding	Thickness of plates not less than	Size of rivets not less than.	Distance of rivets apart not more than.
100 gallons	$\frac{1}{10}$ inch	$\frac{1}{4}$ inch	$\frac{3}{4}$ inch.
250 „	$\frac{1}{8}$ „	$\frac{3}{8}$ „	$1\frac{1}{8}$ „
500 „	$\frac{1}{8}$ „	$\frac{3}{8}$ „	$1\frac{1}{8}$ „
1,000 „	$\frac{3}{16}$ inch if cylindrical $\frac{1}{4}$ inch of any other shape	$\frac{7}{16}$ „	$1\frac{1}{4}$ „

If the tank has a capacity exceeding 60 but not exceeding 250 gallons, it must rest on the ground, or on brick or stone piers, or must be securely and adequately supported on strong girders.

If the tank has a capacity exceeding 250 but not exceeding 1,000 gallons, it must be properly stiffened with vertical angle-irons and cross-stays, and must rest on solid foundations of concrete, brick or stone.

(*c*) Every tank of a capacity exceeding 1,000 gallons must be cylindrical in shape, and must not exceed 26 feet in height or 35 feet in diameter. The top of the tank must be constructed of plates of a thickness of $\frac{1}{8}$ inch, riveted with $\frac{3}{8}$ inch rivets not more than $1\frac{1}{8}$ inch apart, and supported by a sufficient number of strong and efficient angle-irons and ties, and where necessary by king posts.

The sides and bottom of the tank must be of best iron or steel tank-plates of at least the following thickness:—

Namely, within 10 feet from the top of the tank . . $\frac{1}{4}$ inch thick.
„ over 10 and within 20 feet from the top of the tank . . . . . $\frac{5}{16}$ „
„ over 20 feet from the top of the tank . . . $\frac{3}{8}$ „
„ bottom of tank . . . . . $\frac{1}{4}$ „

The plates must be riveted by $\frac{3}{8}$ inch best rivets driven hot, and not more than $1\frac{7}{8}$ inch apart, measured from centre to centre, and all vertical seams must be double riveted.

Every such tank must be erected on good solid foundations, upon which the entire bottom surface shall have a fair bearing, and must be strengthened throughout by a sufficient number of strong and efficient angle-irons and cross-stays.

If the tank has a capacity of more than 15,000 gallons, it must be constructed as hereinbefore described, and further, must be separately surrounded by a wall of such dimensions and substantial construction, or must be partially sunk in an excavation in such a manner that the total quantity of mineral oil capable of being contained in the tank could be altogether contained in the enclosure formed by such wall or excavation, and could not escape therefrom in the form of liquid whether under the action of fire or otherwise; and the space formed by such wall or excavation, so far as not occupied by the tank, must be kept entirely free and unoccupied.

Specification of screen wall.

A screen wall must be substantially constructed of good hard bricks, or such good building stone, not being lime stone, or such concrete as may be approved by the local authority, properly bonded and solidity put together with good mortar or cement, on proper footings and foundations.

creen wall must be of a thickness of not less than as follows:—

Within 16 feet of the top of the wall	13 inches
Over 16 feet and within 32 feet of the top of the wall . .	17½ „
„ 32 „ „ „ 48 „ „ „ „ „ „ „ . .	22 „

and in like proportion for any greater height.

A screen wall must be strengthened by two or more transverse buttresses of similar construction to the wall. The buttresses must be carried up to the top of the wall and properly bonded thereto, and must not be more than 20 feet distant from each other. Each buttress must, at its base, project from each side of the wall not less than one-eighth the height of the wall, and at its top not less than nine inches. There must be no window, door, or other opening in a screen wall other than such fireproof doors as are necessary for the purposes of access to the premises, and are open only when required for the said purposes.

Scale of maximum amounts of petroleum allowed to be kept according to distance from protected works.

Distance of depôt from protected work.	Number of gallons allowed to be kept.		
	Not wholly in tank depôts.	In tank depôts but not wholly underground.	Wholly in underground tank depôts.
Within 10 feet	100	250	500
Over 10 feet and not exceeding 20 feet .	500	1,500	5,000
„ 20 „ „ „ „ 30 „ .	2,000	6,000	20,000
„ 30 „ „ „ „ 50 „ .	5,000	15,000	50,000
„ 50 „ „ „ „ 75 „ .	10,000	50,000	Unlimited.
„ 75 „ „ „ „ 100 „ .	15,000	150,000	
„ 100 „ „ „ „ 150 „ .	20,000	Unlimited.	
„ 150	Unlimited.		

APPENDIX M.

General notes on the construction and management of small Petroleum Installations or tank depôts to assist District Officers in granting licenses for new installations.

1. The tank installation or depôt should be surrounded with a brick wall or moat or a combination of both in such a way that it will efficiently contain and prevent the overflow of all the oil, in case of its escape, that may be stored at any one time in the tanks, filling, soldering and storing sheds, and a certificate to this effect should be obtained before a license is granted.

2. A pipe must necessarily lead from the tank or tanks to the filling room, but no soldering should be allowed in the filling room. The soldering should take place in a separate room or building placed as far from the tanks as can be conveniently arranged, and no more tins should be allowed in the soldering room at one time than are absolutely necessary for expeditious working.

3. The depôts should only be open, and work permitted, between sunrise and sunset.

4. No smoking should be allowed or any fires or lights permitted except those necessary in the soldering room and watchman's house.

5. No goods of a combustible nature should be kept inside the depôt.

6. All operations should be conducted under the charge of a qualified and responsible agent or supervisor.

7. Where an installation is provided with a lightning conductor, it should be tested at least once a year, and a certificate showing the date of the last test hung up inside the installation.

8. Where there are any pipes or openings in the enclosure wall for draining out water, arrangements should be made whereby they can be closed and only kept open when actually necessary for draining purposes.

9. The godown for the storage of tins should not have any inflammable material in its construction, and if it is not situated within the enclosure wall of the installation, its floor should be so sunk or it should be surrounded with a wall so that all the oil stored in the godown can be contained in the sunk floor or within the wall if it should escape from the tins. A combination of sunk floor and a wall is permissible; in this case the wall would not have to be so high.

10. A few baskets of sand should always be kept in the filling or soldering shed, as sand is very useful for extinguishing purposes at the commencement of a fire, where only a small quantity of oil is involved.

11. The ground in the interior of the installation should be kept scrupulously clean and free from vegetation, rubbish, etc.

12. A copy of these notes in English and the vernacular, together with a copy of the conditions of the license and a statement showing the maximum quantity of tins to be allowed in the soldering room at one time, should be hung up in the installation.

C. A. MUSPRATT-WILLIAMS,
Major, R. A.,
Chief Inspector of Explosives in India.

Appendix N.

CIRCULAR No. I—RAILWAY.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

RAILWAY TRAFFIC.

To

THE SECRETARIES TO THE GOVERNMENTS OF
MADRAS, BOMBAY, AND BURMA,
PUBLIC WORKS DEPARTMENT, RAILWAY BRANCH.

THE SECRETARY TO THE GOVERNMENT OF BENGAL,
PUBLIC WORKS DEPARTMENT.

THE SECRETARY TO THE GOVERNMENT OF BENGAL,
MARINE DEPARTMENT.

THE HONOURABLE THE CHIEF COMMISSIONER OF
ASSAM.

THE HONOURABLE THE RESIDENT AT
HYDERABAD.

THE HONOURABLE THE AGENT TO THE GOVERNOR GENERAL
FOR RAJPUTANA.

THE CONSULTING ENGINEER TO THE GOVERNMENT OF
INDIA FOR RAILWAYS, CALCUTTA, LUCKNOW, AND
ASSAM.

THE MANAGERS, NORTH-WESTERN, OUDH AND ROHILKHAND,
AND EASTERN BENGAL (STATE) RAILWAYS.

Precautions to be taken in accepting Petrol or Motor Spirit, Naptha, Benzoline, Gasoline, Benzine, and other dangerous petroleum when tendered for carriage by railway.

Simla, the 24th June 1903.

SIR,

I am directed to state that the Government of India are pleased to rule that petrol or motor spirit, naptha, benzoline, gasoline, benzine, and other dangerous petroleum coming under class D of dangerous goods may be accepted for carriage by railway under the following conditions:—

(*i*) That they are contained in gas-tight iron or steel drums of at least $\frac{1}{8}$th inch thickness, containing not more than 10 gallons, and fitted with well made filling holes and well fitting screw plugs, or in gas-tight tinned sheet iron drums, containing not more than 10 gallons, fitted with screw cap with metal air-tight under-cap or fitted with well fitting screw plugs. These latter drums to be packed in strong wooden cases, the thickness of the wood to be not less than $\frac{1}{2}$ inch.

(*ii*) That the drums shall be so substantially constructed and secured as not to be liable, except under circumstances of gross negligence or extraordinary accident to be broken or become defective, leaky or insecure in transit.

(*iii*) That the nature of the contents and also the words "Highly inflammable" must be distinctly marked on the vessels.

(*iv*) That a certificate is handed in by the consignor to the effect that an air space of at least $\frac{1}{10}$th its capacity was left in each drum at time of filling.

2. (*i*) The vehicles carrying the dangerous petroleum must be well ventilated, and no lamps or naked lights should be allowed in, or brought near these vehicles while so loaded. The chief danger to be apprehended is from leakage, as the vapour of these petroleums is heavier than air and is inflammable, and if mixed with certain proportions of air in a confined space, is explosive.

(*ii*) The drums containing these petroleums must never be allowed to stand in the sun.

(*iii*) Damaged drum should not be accepted and empty drums should not be carried unless the screw plugs or screw caps are securely fitted, as there is always vapour left in a drum even when it has been emptied.

I have the honour to be,

SIR,

Your most obedient Servant,

A. R. JACOBSON,

Offg. Under Secy. to the Govt. of India.